

Name: _____
Student Number: _____

1. If

$$x(n) = \{\dots, 0, 1, 2, 1, 1, 3, 4, 1, 0, \dots\}$$

$$y(n) = \{\dots, 0, 1, 4, 3, 1, 1, 2, 1, 0, \dots\},$$

what is the simplest equation for $y(n)$ in terms of $x(n)$?

$$y(n) = x(-n-2)$$

$$X(-4) = \{0, 1, 4, 3, 1, 1, 2, 1, 0\}$$

$$x(-n-2) = \{ \dots, 0, 1, 4, 3, 1, 2, 1, 0, \dots \}$$

2. Compute the convolution $y(n) = x(n) * h(n)$ of

$$x(n) = \sum_{k=-\infty}^n \delta(k) - u(n-4)$$

$$h(n) = \sum_{k=0}^{\infty} \delta(n-k-2) - u(n-8) + u(n-11) - u(n-17)$$

$$\delta(k) = \{0, 1, 0\}$$

$$u(n-4) = \{0, 0, 0, 0, 1, \dots\}$$

$$\therefore x(n) = \{0, 1, 0, 0, 0, -1, \dots\}$$

$$\delta(n-k-2) = \{ \dots, \underset{\uparrow}{0}, 0, 1, 0, \dots \}$$

$$u(n-8) = \{ \underset{\uparrow}{0}, 0, 0, 0, 0, 0, 0, 0, 1 \}$$

$$u(n-1) = \{ 0, 0, 0, 0, 0, 0, 0, 0, 1 \}$$

$$u(n-17) = \{ \dots, \underset{\uparrow}{0}, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1 \}$$

$$h(n) = \{ \dots, 0, 0, 1, 0, 0, 0, 0, -1, -1, -1, -2, -2, -2, -2, -2, -2, -3 \}$$

$$h(-n) = \{ \dots, 3, -2, -2, -2, -2, -2, -2, -2, -1, -1, -1, 0, 0, 0, 0, 1, 0, 0 \}$$

$$h(-4) = \{-3, -2, -2, -2, -2, -2, -2, -1, -1, -1, 0, 0, 0, 0, 1, 0, 0, \dots\}$$

$y(n)$	0	0	1	0	0	0	-1	-1	-1	-1	-1						
n	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

* out of time



Instructor: B.L. Dakin
Time: 15 minutes
Note: No aids

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1. Evaluate the convolution, $y(n) = (n+1)u(n) * \delta(n-1)$, giving the result in equation form with no summation symbols. Show all your work.

$$y(n) = (n+1) u(n) * f(n-1) \xrightarrow{\text{sub } (n-1) \text{ in for } n} \\ = ((n-1)+1) u(n-1)$$

$$y(n) = n u(n)$$

y_n	0	1	2
n	0	1	2

2. Determine the direct form II realization for the system

$$y(n) + y(n-1) - 3x(n) + 2x(n-2) = 0.$$

$$y(n) = -y(n-1) + 3x(n) - 2x(n-2)$$

